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SANITARY HOUSES

AND

HOW TO SELECT ONE

BY

F. A. BOND, M.B. EDIN. UNIV.

SANITARY SCIENCE CERTIFICATE ROYAL COLLEGE PHYSICIANS, EDINBURGH
MEMBER OF SANITARY INSTITUTE OF GREAT BRITAIN
MEMBER OF SOCIETY OF PUBLIC ANALYSTS

LONDON
KEGAN PAUL, TRENCH & CO., 1, PATERNOSTER SQUARE
1882

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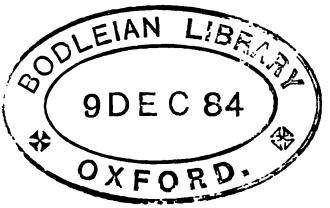

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INTRODUCTION.

THE subject of this pamphlet is of vital importance to every one. It is essentially a question of life and death; yet if not absolutely of life and death, still of how long we are to live or how soon we are to die—subject to certain other conditions to be taken into consideration. It must be self-evident to most that the air we breathe, the food we eat, the water we drink, and the house we live in, must each in their way help to determine the length of time that all the component parts of that complex machine, the human body, will continue to work in unison. There were some people in former days who thought, and I am afraid there are many who from ignorance still say—if not in absolute words, at any rate by their acts—that it matters not whether the air you breathe be sweet or foul, the food you eat be good or bad, the water you drink be pure or impure, the house you live in be wholesome or the

reverse; you must die some time, and these things cannot make much difference one way or the other. Lord Ripon, in a speech he made at Delhi, says, "I very well recollect, a few years ago, the late Lord Palmerston telling the House of Commons, when he was advocating sanitary reform, that there was always in every town in England a clean party and a dirty party—a party that was in favour of a good water supply and good drainage, and a party opposed to measures of that kind." Science here steps in, and shows that due attention paid to sanitary laws will undoubtedly tend to long life, and the neglect of these very laws will as surely bring disease and probably death in their train.

Each of us knows, from personal experience, how bad smells affect our stomachs, and make us feel sick; a very foul stench smelt just before a meal will take our appetites quite away; with some of us it will go further, and disorder the bowels, and, if there be any specific poison in it, may lay the seeds of a very severe illness.

Few of us consider what an important part air takes in our existence. Dr. Angus Smith, in his work on Air and Rain, tells us that we take into our bodies by means of our lungs one to two thousand gallons of air daily. Our atmosphere is composed of

a combination, in certain proportions, of a number of elementary gases; any deviation from the proper admixture of these gases, or the undue introduction of any foreign element so as materially to alter the proportions of the mixture, must have a corresponding ill effect upon the bodies that take in that composition. Thus we can quite understand that a small amount of poison disseminated in that air would soon contaminate the whole system. It will be remembered that foul air killed an immense number of our own countrymen and countrywomen in the Black Hole of Calcutta.

Certain diseases have been shown and proved to be due to an insufficient supply of air, and consequent fouling of the atmosphere by exhalations from the human body. It has been indisputably proved that the lower animals suffer and become diseased by being confined in spaces which do not admit of the air remaining pure. Rossignol says that previous to 1836 the mortality of the French cavalry horses varied from 180 to 197 per thousand. The enlargement of the stables and the increased quantity of the ration of air reduced the loss in the next ten years to 68 per thousand;* thus showing that a purer air increased the length of life of horses. What is true

* Parkes' Practical Hygiene.

in regard to the lower animals is also true in regard to human beings, so far as their animal life is concerned. So that the air we breathe cannot but be an important matter to us in the consideration of the best means of maintaining a high standard of health, and consequent length of life.

As already shown, our bodies obey in many respects the same laws as the bodies of animals; and as one kind of food fattens, nourishes, and keeps them in health, so another kind will have the opposite effect, the more so in certain states of the body and at certain seasons of the year. These facts are well known and acted on by all who graze cattle and fatten them for the market; they take advantage of a certain dietary for their fattening purposes. Just so in the human body, we see the effects of different diets on different bodies. We judge of the food at a certain institution by the general appearance of the inmates. Mark the great eater by his full and bloated appearance; the man of spare habit by his thin face and attenuated limbs. The subject has been studied at our prisons by Dr. G. Wilson,* and the value of the different diets has been noticed on the prisoners; the amount of work they can perform, and

* For further particulars, see "A Handbook of Hygiene and Sanitary Science," by George Wilson, M.A., M.D.

what certain quantities of particular foods are capable of producing, have been reduced to a mathematical calculation. As appropriate food is a necessary means of maintaining our bodies and supplying them with those ingredients which, by a process of alteration and assimilation, maintain them and keep them in a healthy working condition; so an inappropriate diet, with or without absolutely noxious ingredients, is capable of disarranging our functions and inducing a state known to us as disease. Poisons are introduced into the system by means of food. The ova of parasites also obtain entrance into our bodies, and grow and derange our functions: familiar instances of this are worms of all sorts, especially tapeworms. Besides these, the flesh of diseased animals. This is one that has not been fully worked out. Still we have got so far, that the flesh of an animal suffering from any form of disease, let it be what it may, is considered unfit for human food. The flesh of any animal infected with a specific poison, if taken into the body as food, is liable to produce grave disorder, even if it does not reproduce the specific disease. A diet, like the composition of the atmosphere, should consist of certain substances in certain definite proportions; an excess of any one over the others, if continued in, is sure to produce some change

in the animal economy. Some portion will be developed at the expense of the others, one organ will be acted on more than another; and if that goes on certain changes will take place in that organ which may lead to disease. Here we are not speaking absolutely, for it is well known that nature is very tolerant, and, within certain limits, will stand almost anything. Time develops habit, which in its turn becomes second nature. This, however, does not militate against the broad principle that whatever tends to alter the even working of the machine produces more wear and tear in one part than in another, and, when the human body is the machine concerned, that part becomes more liable to disease; thus showing that it is not a matter of indifference what food we eat. A bad or unsuitable diet will, if persisted in, soon clog the machine and the person may die.

The water we drink has of late years been shown to play a much more important part in our longevity than our ancestors had any idea of. Death was in the cup of many a bright, clear, sparkling water, which might have been taken by the uninitiated as the very emblem of purity. It is not long since that the holy water of a Mohammedan well in the East, which is carried as a sacred relic by the faithful to all parts of the world and the drinking of which is considered by

them to be a pious act, on analysis was found to be little better than diluted sewage, and doubtless carried disease and death into the homes of many a true believer. Science has given us a way of testing these waters, and thus enabling us to avoid those that are most detrimental to our bodies. Waters contaminated with sewage are now known to produce certain fevers and diseases most fatal in their nature. Such waters may at any moment introduce a poison—a minute particle—which, entering the blood, sets up a process similar to fermentation, just as a tiny spark may set up a huge conflagration, and that fermenting process may be the means of checking, even at its very outset, a career which, but for that, might have gone through the usual term of a human life. Nay, more; just as the tiny spark sets the conflagration going which may extend to unknown proportions, so this fermenting poison may, besides wrecking one life, wreck hundreds more.

Professor Wanklyn says, in his "Introduction to Water Analysis," "Medical authorities are at the present time pretty well agreed, that if the water of a well, which has received the excreta of a patient suffering from cholera or from typhoid fever, be drunk, there is the utmost danger that the drinker may contract those diseases. It is also a received fact that the drinking

of water which contains an undue proportion of organic filth—even assuming specific poison to be absent—is injurious to health." Dr. Simon, in his address on Public Medicine, at the International Medical Congress, says, "We have learnt, as regards those diseases of the animal body which are due to various kinds of external causes, that probably all the most largely fatal of them (impossible yet to say how many) represent but one single kind of cause, and respectively depend on invasions of the animal body by some rapidly self-multiplying form of alien life. This doctrine, which scientific experiment initiated, has for the last dozen years been extending and confirming itself by further experiment. As soon as the doctrine began to seem probable, Science saw that, should it prove true, it must have the most important corollaries. If the cause of an infecting human disease is a self-multiplying germ from the outside world, the habits of that living enemy of ours can be studied in its outside relations. It becomes an object of common natural history; it has its biological affinities and analogies. We can cultivate it in our test tubes in our laboratories, as a gardener would cultivate a rose or an apple, and we can see what agrees and what disagrees with its life. And then, as the next and immeasurably most important stage, when

nothing but experiment on the living body will help us, we can try whether perhaps any of our modifications of its life have made it of weaker power in relation to the living bodies which it invades, or whether, through our more intimate knowledge of its vital affinities, we can artificially give to bodies which it would invade a partial or complete protection against it. Such, at first blush, were the obvious possibilities of research which the new doctrine of infectious disease suggested to the mind of the pathologist; and never, since the profession of medicine has existed, had a field of such promise been before it. The promise has not been belied. A host of diseases have been worked at in such lines as I just now indicated, and with many of them important progress has been made." Disguise water as we like, we still take it in tea, coffee, beer, soup, etc.; our food is boiled in it: therefore we take it into our bodies in one form or another, showing that if we would know ourselves and how to keep ourselves in health, it is not a matter of indifference what water we drink.

In the olden days—in those good old mythical times—a habitation was merely a place to dwell in. In primeval times it might be a cave, with a few rough portions of rock placed before the entrance to act as a door; or it might have been a hole dug in the

ground, with simply a few branches of trees covered over it to act as a roof; or it might have been an abode built in a tree, composed of nothing but branches twisted together, after the manner of a bird's nest, and probably suggested by it. All these, in different climes, have acted as the home of man. As time went on and civilization advanced, rough stones took the place of caves, holes, and branches; they were piled one on the other in rude unshapely masses, and the crevices filled with mud, in order to keep out rain and wind. Advancing further, the single room gave place to two, then one above the other, mud was replaced by mortar, and bricks took the place of stones. One change brought another, and as the mind of man developed, so his requirements in the shape of a house increased, and step by step, stage by stage, the domicile of man became more and more a work of art; he took more delight in it, and spent more time in adding to its beauty, till now we see those splendid mansions which combine all that luxury, art, and wealth can achieve. For all this, in the present day the greater part of our habitations are not what, with our knowledge, they ought to be; the mass of our people do not sufficiently bear in mind that the nature, construction, and healthiness of our house have a great deal to do with the length of time our bodies can live in them.

As general principles of physiology become more diffused, man will become more particular in the selection of his house, and the question of convenience and expense, which in the present day is almost if not quite paramount, will then become a question of secondary importance, and badly constructed houses in unsanitary conditions will become a burden to their owners ; for it will be difficult to find any one to inhabit them. We are sometimes confronted with the reputed healthy state of the Highlander, whose abode was constructed in such a manner that on his going out he could put his hand down the opening in the roof that acts as a chimney, and lock the door from the inside and take the key with him ; consisting, therefore, of a single room, and that not of a great size. True ; from what ailments that man suffered we are not told. We do know that of a family raised in such an abode the mortality is great, and that only the strong ones survive and reach maturity. It is, I believe, a granted fact that the average age of people in a good position, a hundred years ago—take the middle class—was not so great as it is now. After making due allowance for the altered mode of life and habits of the people, that fact speaks for itself. It is not, then, a matter for indifference what sort of house we live in, for the house plays an

important part in the longevity of its inhabitants. Let this be granted; then surely it must become a matter of the utmost consideration to every one what sort of house he or she lives in, and no time can be considered as wasted that is expended in examining into every minute particular connected with the sanitary state of that house.

SANITARY HOUSES.

"More water glideth by the mill
Than wots the miller of."

Titus Andronicus.

LET no one suppose that a house must be expensive or of high rental because it is healthy. I will at the commencement say that the smallest cottage, at a rental of even a shilling a week, can be made as healthy, and placed in as good a sanitary condition as the largest palace, probably more so. I hope in these few lines to be able to prove to all that the highest sanitary excellence can equally well be obtained by poor as by rich. Sanitary improvements and attention to sanitary laws do not necessarily mean increased expenditure. On the contrary, good sanitation simply means attention duly paid to the laws of health, and not necessarily at great expense.

All sanitary improvements are matters for grave consideration, and very deliberate action. The true sanitarian, in building, merely carries on the usual engineering and building work, but keeps in his eye all through his work the question of health; of free exit for all refuse, so that no organic matters are pent up to ferment and putrefy; of free ventilation, in order that any impure gases, which under the most careful arrangement must sometimes be generated, should be properly diluted and oxygenated, thus promptly removing their destructive properties and preventing them, even in their partially harmless condition, from entering buildings, to be inhaled by their inmates; of keeping the water supply free from all possible sources of contamination; and of seeing that there is a sufficient quantity for the probable number of inhabitants.

Such being the chief points in the proper construction of a house, it follows that all alterations in a house already built must be on this basis. In building a new house, it is comparatively easy to provide against dangers that are known to exist in old ones. When we have old ones to deal with, when certain evils do exist, there is a difficulty in devising measures which will render them innocuous to the inhabitants, whilst at the same time very great

caution is necessary, for while effectually removing a possible source of danger, we may be incurring great expense and damage to the invested right of the owners of the house. If I mistake not, some such view as this was held by the commissioners who investigated the subject. Still, by carefully considered measures the two interests may be made identical, and the removal of a defective point may be made a benefit in the shape of increased health to the inhabitant, and a benefit to the owner in the increased value of his property at a trifling cost. Sanitarians of the present day, in their great zeal and wish to place everything at once in a perfect sanitary state, too often forget that the measures they suggest, possibly perfect at the time, as knowledge increases may not be so in a few years, and should they have suggested any elaborate reforms costing much money, they may live to regret it.

Let us suppose that we are in want of a house. The "we" we will take to be a person of limited means or an artisan; for the rich man has no difficulty in selecting a house, and generally obtains the services of an architect, who goes over the house in a business-like way, examining its structure and the state of repair that it is in. The sanitary officer or engineer is also sent to look over it and examine the house.

There is now a society formed for that purpose, who undertakes the sanitary examination of a house. These persons point out the faults and show the remedies, so that the rich man knows exactly what he is entering on before he completes a purchase or enters on a tenancy. In the case of a person of limited means or an artisan, the case is very different. He is probably, from force of circumstances or the exigencies of his work, compelled frequently to change his residence as the locality of his work alters. In the majority of cases his selection is determined either by convenience or by rent. These are necessarily very important points, and should have their place in the selection of a home, but they are not matters of the first importance. Dr. John Haddon, in Health Lectures for the People, delivered in Manchester, lays it down as a rule for the preservation of health, that the house you inhabit should be well built, on a good plan, properly drained, and in as open a situation as possible, so that the air may circulate freely around it.

Having selected a number of houses that might suit you, begin with the soil that each is built on.

Professor Parkes divides the soils into ten. These are: The granitic, metamorphic, and trap rocks; the clay slate; the limestone and magnesian limestone

rocks ; the chalks ; the sandstones ; the gravels ; the sands ; the clays, dense marls, and alluvials ; the cultivated soils ; the made-up soils.

These all vary in healthiness. We must bear in mind, in all our considerations with regard to soils, that all contain water as well as air, that the former is held in the interstices, and is considered as moisture and ground water. How far the ever-varying levels of this subterranean tide exercises a beneficial or baneful effect on our bodies is a question that, from want of data, has as yet borne no fruit ; that it must play some part with regard to health, I think we must admit. The relative value of these, however, is more for the expert than the general public to determine. If we were asked to make a selection, we should in all probability take a house built on a gravel overlying a clay or rock. Such a soil cannot always be got ; but carrying this in your eye, you should obtain the nearest you can to it. Especially avoid the made-up soil, one where the hollows have been filled up with ashes and town refuse. The exhalations from such a soil would not be of the purest character, nor can we be, surprised that the inhabitants of houses built on such conglomerations of filth should be sufferers from typhoid fever, diphtheria, and the like. In general terms, we may say we should

select a loose soil in preference to a close compact one like clay. Still, we do not condemn clays entirely, as a mixed soil in which clay predominates is known to be not a bad one; some well-known and important places and towns are situated on such, and are considered fairly healthy. Whilst examining the ground, note the state of the walls of the house where they emerge from the soil, as to damp rising. The fault is not always that of the soil, it may be in the material or the construction. Now that the fact is so well known that damp walls may be improved, if not absolutely cured, by a trench run close to them and drain-pipes laid down, it is as well to make the inquiry if such exist; if they do, and you still see the damp rising up the walls, you would naturally give much of the credit to the soil, unless you had indisputable evidence that it was due to the construction or the material.

Having pitched on a house with a soil to suit you, the next question should be, Is there a sufficient space around it to admit of a free play of air? There should not be too many trees close to the house, nor a high wall close to the windows, nor the windows blocked with ivy. This latter, though often rendering a house very picturesque, sadly interferes with the supply of air through the windows; for though the

intention is to keep it closely cut, still the natural tendency of ivy is to encroach. Besides, by the way in which it thickens and projects from the wall, it makes it more difficult for the air to enter the window. Added to this, it harbours a great many vermin. If it keeps out the air it will also keep out the light. We know that light is as essential to our well-being as air, and a deficient supply of air means the same with regard to light. Should the house be in a street, with buildings on each side, notice should be taken that there is a sufficient opening at the back and front to allow the air to circulate freely, and that the houses are not too close back to back ; all alleys and small courts should be avoided, the more so where the houses abut on dust-bins and privies. It would be more preferable to live in the outskirts of a town than in such places, even if it added an hour in time and two or three miles in distance to the day's work. In these small courts and alleys in a town—where the entrance is by a small opening into the main street, and the very existence of which is hardly known to any one but the dwellers and the police—the houses are, generally speaking, in wretched repair, and are wanting alike in ventilation and light. They are generally inhabited by a very low class, who prefer these dens to a better class of tenement, which of itself ought

to show us that there is nothing so demoralizing to a people as the existence of such abodes. Children brought up in them take to vice of all sorts, just as naturally as if it was a "rule of the house." I have reason to believe it is true of the rural districts, and I should think it was equally so of the towns, that the worst characters are generally to be found in the worst houses. In the Report of the Dwellings Committee of the Charity Organization Society we find it laid down that—"The physical improvement of the masses must precede their intellectual and moral elevation; and between the house and its inhabitant there is often a community of character."

The position of the house as regards the surrounding country is also a matter for selection. For, whether it be in the town or in the country, if we have high or low ground to select from, we should avoid both the top and the bottom of a hill. The latter is almost sure to be damp in rainy seasons, and the water would stand about unless there was a most complete system of surface drainage, and even then, at exceptional times, you might be subject to an overflow. The objection to the top of a hill is that it is exposed to all the vicissitudes of the weather, without the slightest protection. We would select, as one of the best positions,

a house on a western or south-western slope, facing either the west or the south, and having as open a space in that direction as possible, and any protection on the north or east would add to the advantage of the situation. Trees, woods, etc., would be no objection if they were not too close to the house. A house on an eastern or northern slope should be rejected as an unsuitable situation. It would be the last you should take if there were any other that at all answered your requirements.

There has been a great hue and cry of late years on the subject of drainage, especially of towns; and rightly so. The existence of diseases due to bad drainage has only been brought into notice of late years, and the eyes of a few have begun to be opened to the danger that lies under their feet. The question becomes daily more and more difficult to solve. As towns increase, you have added miles and miles of drain-pipes to be dealt with; the ramifications become more intricate, and the danger of a break or a stop in the circulation more likely and more difficult to find. The drainage of the house should next occupy your attention, and this is a matter for your most careful consideration, as on it much of the healthiness of a building depends. The drainage of the house you intend to live in should be perfect. It is not sufficient

that it should be fairly good; it must be perfect: one slight defect, one badly joined pipe, one broken pipe, or a pipe that has sunk so as to admit of sewage escape into the surrounding soil, one defective trap, one accumulation of filth,—and the house becomes a poisoned den. It is a matter of very great difficulty to find out what drains there are, and where they are situated, especially in old houses or houses that have been added to or enlarged; but nevertheless it should be done.

As a matter of general information, few people know, and fewer care to trouble themselves to know, to what diseases impurities introduced into the system from without give rise. When, on a case of sickness occurring in a household, the medical attendant calls their attention to the fact that this illness might have been prevented had certain precautions been taken, they for the first time learn that such and such diseases existed, and were due to certain known causes which were preventible. The only remedy for this is more education, and the introduction into our schools of courses of physiology, and the popularization of certain facts and data with regard to health and disease.

Dr. Neil Arnott says, in his examination before the Commissioners for Inquiring into the State of

Large Towns and Populous Districts, "It really is a most important part of every man's education to learn a little of physiology in its applications to the preservation of his health, and I have no doubt that in a few years this kind of knowledge will be much more common."

There is no necessity for entering on the full scientific discussion of the subject, for to understand that years of study would be required; be it sufficient for the general public that the facts be established, leaving to *savants* the why and the wherefore. In reality, the middle-class house is often in a better sanitary state than the higher class as regards the drainage, especially in a town, where the drain-pipes from the sewers are often, for convenience, carried right under the house, perhaps to meet a drain in front. Sometimes the stable drains are done in this way. A fault in one of these pipes, if the soil were not covered with a layer of some impermeable substance, would render the air in that house worse than it is in the stable or the sewer, because you would have the accumulated filth of the stable or the sewer for some time, soaking into the soil under the house, not simply the amount for one day. After a time gases would rise, passing through the floors into the living-rooms. It must be taken as a received

scientific fact that air passes readily through walls, floors, wood, etc.

We may here just state that sickness, obstinate vomiting, diarrhœa, and sore throats, with blood poisoning, are generally dependent on impurities of air or water. Diphtheria, a disease that is often epidemic in form, is generally from the same cause. So also is typhoid or enteric fever. Then there is phthisis, or consumption, that has been supposed by some to be the direct result of overcrowding or impure air; be that as it may, no doubt, if the predisposition exists, it is brought into activity by it. The case is different with typhus fever, which has been clearly proved to be the result of overcrowding; and amongst diseases supposed to be from the same cause is ophthalmia, a disease of the eye, seen principally in camps and where large bodies of men are collected together in small spaces, or in families that are very much overcrowded. Erysipelas, gangrene, and pyæmia may be classed together, as they are often seen under somewhat similar circumstances; the latter being the great curse of hospitals, where it is most frequently seen in the surgical wards. When it makes its appearance, the whole place is cleared out and at once thoroughly disinfected: in this way its ravages are often stopped. It is by no means confined to hospitals; it is to be

seen occasionally in private houses. Ulcers, boils, and carbuncles too are sometimes put down to the same cause. Perhaps what is the most common of all, and seldom receives much attention, is general *malaise*— that state in which you are not well, and yet you are hardly ill; there is something the matter with you, you can hardly say what. I think in most cases, though not in all, there is this premonitory stage before any of the other more serious evils from defective drainage show themselves; but being of a trivial nature, it is often overlooked. All these diseases are more or less met with in places where large numbers of human beings are living together in a confined space. Do not form the idea that, because a number of people are living together, these diseases will show themselves; on the contrary, large numbers of men and women are living together in more or less confined spaces with impunity, but there must be proper attention paid to sanitary regulations, or the penalty will be the introduction into the community of one or other of these diseases. Mr. Edwin Chadwick says, "The gain derivable from sanitation may be illustrated from its advance in the military service. The first army which went out to the Crimea was chiefly under the curative or medical service, and it was lost. Sanitary commissioners trained in service under the first General

Board of Health were sent out, and the War Minister declared in Parliament that, by the application of their science, the second army had been saved and brought back in better health than it had before at home."

Supposing the house to be situated in the country or village, make every inquiry first, from people connected with the house, as to the number of drains, their position and formation; whether they are of brick, stone, or pipe; at what points they can be got at to be examined. Do not let the owner of the property dissuade you from personally examining the drains and seeing the state they are in, by telling you they are all right, that they have been inspected, and the like. See for yourself the state they are in and what quantity of sludge there is, that the flow is steady, and that the sudden introduction of water at one end is continued to the other or at any point where you may be watching. In all your examinations of drains, be careful not to bring a naked light too close to the opening in the drain, for fear there might be any gas which would lead to an explosion. Then examine the house end of the drain, to see that it is trapped, and also that it is ventilated; this latter is an important point, for if the main drains are properly ventilated, the sewer gas is so diluted that, should the traps which open into the house or yard become defective,

and are forced by the gas—and what traps will not be forced by sewer gas under certain circumstances?—not much injury is done to the inhabitants. The sink is a most important point, and should be most carefully examined with the drain under it. This is always trapped, but the trap is often broken or defective. From habit, people often look upon a sink as necessarily a bad-smelling place, and think nothing of an offensive smell coming up the grating, which is often sewer gas. When you consider that for culinary purposes, or washing dishes, etc., people often stand for some time over a sink, breathing in the sewer gas; should there be any germs of specific poison in it, the chance of those persons escaping disease is very small. All sink-traps should be periodically examined and cleaned; if broken they should be carefully taken out, and if the breakage extends to the pipe, that should also be removed: a broken pipe should never be allowed to remain. If there is such a thing in the house as a fixed-in washstand, with a plug that closes the pipe communicating with the waste-pipe, that should be trapped; if in no other way, let it be by the ordinary syphon bend. For if not, when the plug is removed, it simply becomes a ventilating shaft into the room; sewer gas passes direct from the sewer, up the pipe, into the chamber. Should the plug be accidentally left out

for any length of time, say during the night, the air of the chamber becomes the same as the air of an ordinary sewer, and for practical purposes you might as well be sleeping in the sewer.

As a general principle, all pipes leading into the sewer should be both ventilated and trapped. Gas, from various causes, is sometimes quickly generated in some portion of a sewer; from pressure it passes readily up any pipe, probably the first it comes to, or where there is least resistance. Passing quickly along, it comes to a trap. If much gas is generated the force would be great, and one of two things would happen—either the trap would be forced or the pipe burst; the resistance being less in the direction of the trap, that, as a natural sequence, is forced, and the gas escapes into the house. Now, if there were an opening in the pipe for a ventilating shaft of a sufficient size, just before the gas gets to the trap, the resistance would be less in that direction than in that of the trap, therefore the gas would pass up the shaft, which ought to conduct it into the open air, where it can do little or no harm.

Should the house be in a town, the drains are more difficult to get at, and consequently the state they are in more difficult to discover. A plan of the drains should be insisted on; if such a thing is not

to be had, any local information that is available should be got. The traps should be carefully examined, and any bad smell about them should not be passed over. The appearance of the ground, bricks, or pavement in the neighbourhood of the traps, or in the course of the drains, should be noted ; if there is any damp, it generally indicates leakage. The drains at some point near the house should be examined, to see what amount of sludge is in them, if any.

In a town you are not likely to have cesspits in use.

The water-closets and the soil-pipes should be carefully gone over. This is the portion of the house that will give you the most trouble, as it is here that the great danger arises ; this is the most common entrance-point of septic poisons to a house, and therefore it should be most carefully guarded. The water-closet should be as far as possible away from the living-rooms, and it should be freely ventilated. A ventilating shaft into a closet is always a good thing, as by that means there is a constant change of air going on in the closet all day and all night, the more so if the window is kept a little open. It is as well to have the door and window opposite each other, as by that means a thorough draught can be sent through

it. It is also as well to have the door of the closet made to fit tightly, either with indiarubber or some soft material round the edge, so as to prevent the air of the closet passing into the house. It has generally been recommended that the closet should be built jutting out from the building; that, doubtless, is the best plan, but you seldom or ever see it in small houses. There should be a good substantial wall separating it from the inhabited rooms; often these partition walls are little better than lath and plaster, and readily admit of the interchange of air between the closet and the house, thus rendering the atmosphere in the adjoining rooms unpleasant to be breathed. The soil-pipe should be trapped, and also ventilated by a pipe running up to the top of the house; these pipes should be of a good size, otherwise they are useless. The soil-pipe should be placed in such a position that it can be got at readily to examine, and on no consideration should it run in close connection with a water-pipe. We often see this precaution neglected. The particular form of seat and pan is a matter of very little consequence. Bear always in mind that the simplest are generally the cleanest, and therefore the best. The cistern which supplies the closet should not be the same as that which supplies the drinking or

cooking water for the house. The overflow-pipe of the cistern should be trapped by a simple syphon bend, as this pipe, in all likelihood, runs directly into the sewer, thus forming a communication between the sewer and the interior of the closet through the cistern. Should the cistern be situated outside the house, and not used for drinking or culinary purposes, with free ventilation, technically not very much stress need be placed on the trapping of the overflow-pipe; still it is as well it should be done. The furniture of the closet should be as simple as possible. The walls should be either covered with cement, or painted, or have a simple paper, sized and varnished, so that the walls can be washed down or wiped with a damp cloth. The floor should be covered with oilcloth, or have the boards plain or stained and varnished, or laid with tiles, so as to allow of frequent washing; carpets and all things capable of harbouring filth should be avoided. What we have said here in regard to the closet in a town house is equally applicable to a house in the country. The bulk of small houses in the country are furnished with a wretched modification of the earth-closet, consisting merely of a small hovel, in which there is a seat with a hole cut in it, with a box underneath, or, still worse, simply a trench. Box or trench has to be cleaned out by a scavenger, and

the time for so doing is generally settled by the tolerance of the nasal organ. When the stench becomes unbearable, then it is cleaned out, and not till then. These places cannot be too strongly condemned. In their place we would recommend a regular earth-closet, with a receptacle for earth, and a mechanical contrivance by means of which a certain quantity of earth is thrown into the box every time the closet is used; or else a regular water-closet: they are so readily made now that the owner of a house can hardly be justified in refusing to have one on the score of expense.

From this we should go to the cesspools. In the country or village you cannot well do without them. Find out if they are too near the house, and, if so, see if you can prevail on the owners to have them removed to a proper distance, and quite away from the wells; see that there is a proper overflow-pipe, and trace it to where it terminates. Notice if the pipe leading to the cesspool is trapped on the side next to the house, and also if the cesspool itself is ventilated; should it not be so, one of the agreements of the tenancy should be to have it done before entering the house. It may be here mentioned with regard to cesspools, that in making one it should be of brick, built in a clay puddle, and lined with cement,

divided into chambers, with strainers, etc., according to the particular fancy of the individual. The point in connection with cesspools that is too often lost sight of is, that they should be frequently emptied. Too many people content themselves with providing what they choose to consider a first-rate cesspool, after the latest pattern. Having done that, they forget all about having it emptied, and it is allowed to go on accumulating till it becomes a nuisance; then they are inclined to lay the blame on the structure or its maker, whereas the real fault lies with themselves in not having it emptied often enough. The contents of a cesspool, properly treated, is a valuable manure. There is a very simple and costless plan of rendering it innocuous: a circular bed is made of cinders, the refuse of the fires; the contents of the cesspool is placed in this, and then filled in with fresh ashes or cinders, and you obtain a manure almost inodorous.

The next point to investigate is the ash-pit, or dust-bin. These are mostly to be found in the back yard, built into or against a wall, and are often a very fruitful source of nuisance. They are supposed only to contain ashes, dust, and the sweepings of the house, but as a rule they are often full of green tops and skins of vegetables, which lie putrefying, giving off offensive and obnoxious gases. As these are often

built just below the back windows, the smell is driven into the house, and exert a baneful influence on the health of the household. These receptacles have tops, which ought to fit closely, but, from carelessness or clumsiness of the servants, they are often slammed down and broken, thus admitting the rain and causing soakage into the surrounding soil. For this reason they ought not to be close to wells, as few things could be worse than the leakage from decomposing vegetable matters. One cannot but admire the plan pursued in some cities, such as Edinburgh, where the ashes and refuse of every house are placed in a wooden trough that is made for the purpose, simple and strong, and each night is placed outside the door, on the edge of the pavement, between the latter and the road, so that it may cause no inconvenience to passers-by during the night, and early next morning the dust-cart comes round, and each receptacle is emptied into it; so that before people are stirring about in the morning, the refuse of the whole city for the previous day is entirely removed and taken to some place outside the town, to be disposed of in the manner the sanitary authority think best. By this means the whole difficulty of dust-bins and ash-pits is got rid of at a swoop, and that which when accumulated becomes an incubus and a nuisance,

by this means is converted into a matter of interest and possibly of profit. In the country or village, the ashes and dust, if properly separated from decaying vegetation—the refuse of the kitchen, and kept by itself in a dust-bin, or simply in a heap, can be utilized when disposing of the contents of the cesspool, as we have already noticed, and then used as a manure. Ashes by themselves, if unmixed with vegetables and kept dry, can be no source of danger, nor even offensive.

In the country you are more or less certain to have a pigsty. The keeping of a pig by a labourer is looked upon by the rest of his class as the indication of his standing among them. The man that keeps a pig is looked upon as a well-to-do man. The houses of an artisan, and those a little above him, are often furnished with a sty, and you will often find it built close to the house. Local authorities try to insist on the pigsty being a certain distance from the dwelling, but their good attempts are sometimes frustrated by the ignorance and prejudice of the very people for whose benefit they are trying to legislate. The further away from the house the sty is the better. Should it be impossible, from local circumstances, to have it far from the house, then all that can be done is to see that it shall be as harm-

less as possible. To do this the floor should be on a slope, which should terminate in a good drain; if there is a cesspit to catch the drainage from the sty, that should be looked at to see it is properly ventilated, and it should have a proper overflow-pipe, and where that terminates should be a matter for investigation. If there is no catch-pit for the contents of the sty-drains, you must not rest satisfied that there is a drain, but you should make yourself acquainted with its course and destination, and that it is not likely to do harm by passing too close to the water supply. Above all, see that all the drains are pervious, as what comes from a pigsty is generally of a very offensive character. No great accumulation of filth in or about a sty should be tolerated. The presence or evidence of rats in or about the sty should be looked for, as the flooring will often be broken up in quest of them. Dr. G. Wilson, in his book on "Healthy Life and Healthy Dwellings," says in regard to drains, "Rats in a house are almost a certain indication that the drainage is defective, and that there are free openings somewhere." Lastly, see that the sty is freely ventilated, that there is a possibility of getting a current of air freely through it. Country folks have an idea that pigs do not do well unless they can be kept very warm. In pur-

suance of this plan, they adopt every means in their power to prevent a breath of air getting to the sty. It is generally built in a corner where it is almost impossible to get a current of air, consequently they become nurseries for the germination of poisons. Free ventilation does not militate against keeping the animals warm. On the contrary, with good ventilation the animals will do better than without it. Here again the extreme ignorance of the masses, their utter want of knowledge in all matters regarding health, and their disbelief in what they are told, is a source of loss to themselves which might be avoided, and of danger to their neighbours.

With regard to cow-sheds, the same remarks hold good. They should be as far away from the house as possible, properly floored, with good running drains, and capable of being freely ventilated, and no accumulation of filth should be allowed in or about them. By this means the animals are kept healthy, and prevented from becoming a possible source of danger to their owners. As milk so largely enters into the diet of the people, it is of the utmost importance to the general public that the animals giving that milk should be kept in as healthy a condition as possible; and now that it has been so clearly demonstrated that the germs of disease can be con-

veyed in milk to such an extent as to cause an epidemic, cow-sheds must, and doubtless soon will, become places for careful inspection and regulation.

Fowl-houses, too, are better away from the dwelling-house. Well-ventilated warmth can be communicated to them by means of a fireplace with a grating over the fire as a guard, or by means of a flue running round them, or by hot-water pipes. They should be frequently limewashed, and the collections of dirt periodically removed. Fowls usually have a great quantity of parasites about them in the shape of lice and fleas, and for this reason, besides their liability to epizootics,* it is desirable that they should be kept at a distance from the dwelling-house. In a town it would be very unlikely that there would be either cow-sheds or fowl-houses attached to such dwellings as we are considering. Fowls are sometimes kept in the dwelling-house, in a town, in unused rooms: it is not healthy, and should not be countenanced. They are sometimes kept in wired-in cages at the back of small houses, or at the bottom of the little yard. That they do live and lay eggs and thrive after a fashion, no one can doubt, but, at the same time, whether it is good for them or the people living all round is very doubtful.

* Technical term for epidemics amongst animals and birds.

The houses we are examining are not likely to be supplied with stables; should they be so they are sure to be close to the house, and small, ill-ventilated, ill-drained places, which had better be used for any purpose rather than for what they were intended. The air of stables, we may conclude, is objectionable, though there has been a variety of opinions about it. Dog-kennels too, if not frequently cleaned out and the dirt removed, become a source of nuisance; otherwise they are comparatively harmless, as nature has endowed dogs with sanitary instincts which are wanting in some other animals.

A supply of pure water constitutes one of the necessaries for good health. It is one of the most important points in the taking of a house, and should occupy a prominent position in our investigations. So much importance was attached to a good supply of water by the ancients, that a good spring was always first selected, and then the house built close to it, then another, then a few more, then it became a village, and eventually a large town. Many important cities in this country have taken their origin from a good spring or a good well; some from certain peculiar properties of the water, as medicinal springs, and so forth. The natives of some parts of India to the present day speak of getting a change

of water, just as we should of a change of air. They attach more importance, in a curative point of view, to the change of water than to the change of air. In the country or village the supply of water for a house is generally from a well, to which we should direct our attention, and not be satisfied till we have seen the interior and examined its walls. The upper part is the portion to be specially examined, as most drains are near the surface. If it is necessary to look further down into the well, it can readily be done by lowering a lighted candle. Any oozing through the bricks or any fluid running down the walls should be noted, as it may furnish a clue if the water is found to be impure. Drains running close to the well should not be tolerated. The air of the well should be smelt; not that it follows that, because the air of a well smells bad, its water must necessarily be impure, as what could smell worse than the air of a sulphurous well? yet the water of that is not injurious to drink. Escape of gas into the well might be a source of contamination, and generally points to the fact of drain leakage taking place in the neighbourhood of the well. Lastly, a sample of water should be taken and submitted to a competent person, either the analyst or the medical officer of health, through the inspector of nuisance, to determine whether the water is potable

or not. All these points being settled to your satisfaction, next inquire as to the capacity—whether the well, under ordinary circumstances, is capable of supplying the household with sufficient water for both washing and drinking. The old axiom, that "cleanliness is next to godliness," is one that is often forgotten in the present day, and cannot be too much impressed on the household. Professor Parkes says, "I have measured the water used in several cases. The following was the amount used by a man in the middle class, who may be taken as a fair type of a cleanly man belonging to a fairly cleanly household:—

	Gallons daily per one person.
Cooking	0·75
Fluids as drink (water, tea, coffee)	0·33
Ablution (including daily sponge bath, which took two to three gallons)	5·0
Share of utensil and house washing	3·0
Share of clothes (laundry) washing, estimated	3·0
	12·08"

Or, on a rough calculation, it requires twelve gallons daily for each person in the household. With this data you can make a calculation as to the quantity of water likely to be required, and then compare that with the quantity of water the well contains at a time. It is not necessary to go into the question of the rate

at which the water goes into the well from the spring, etc. That is only necessary for a strict scientific investigation. If you have any suspicion that it is a very old well and has never been cleaned out, the quantity of sediment at the bottom can be noticed by several methods; the readiest is to stir it up and then pump out some of the water before it has time to settle, and from an examination of the water you get you may form an opinion as to its amount and composition. Should the house be situated in a town, you would probably not have a well, the water supply would be from a water company. Having satisfied yourself that the water supplied by that company is good—information on which point you would readily obtain from one of the inspectors of nuisances—you have merely to see that the conveyance of that water by means of pipes is intact, and, should the supply not be constant, that you have a proper receptacle for storing a sufficient quantity for the use of the inmates; the receptacle itself should be of such a nature as not to injure the quality of the water. First, with regard to the pipes: that as little lead piping should be used as possible; that the pipes should be of a sufficient size, and not run too close to soil or waste pipes, as in frosty weather the pipes might burst and one open into the other. Then, if the supply is not con-

stant, the house should have a cistern, which should be big enough to hold a sufficient quantity of water for the household during the time the supply is shut off. Most cisterns are too small. It is better to have them too large than too small. They are, generally speaking, best made of slate, if they are properly cemented in and prevented from leaking; but that is a great difficulty. Perhaps on the whole iron cisterns answer the purpose as well as any. The great objection to them is that they might impart some of their metallic properties to the water, which might be unpleasant, but would hardly be poisonous. They should be periodically cleaned—a process often considered by householders as quite unnecessary. It is obvious that, however good the water may be, if it flows into a dirty cistern and remains there, it soon becomes foul and unfit for use. The cistern should be properly covered in and ventilated; this latter is a more important point than one would at first suppose. For water has a decided tendency to purify itself, if it is left standing with a supply of fresh air. You cannot leave the cistern wholly exposed, as in a town the dust, soot, etc., falls into it, and it becomes foul. It should be placed where it is not exposed to the full effect of the sun; a little roof projecting over it is good, as it is necessary to keep it from both heat and

light. There should be a ball-float trap, so as to prevent waste; and the overflow-pipe should be trapped by a simple syphon bend, so as to retain a little water in the pipe and prevent the passage of sewer gas into the cistern, as the waste-pipe leads directly down to the sewer, and unless there is some obstacle we are sure to have the water contaminated; or the overflow-pipe might terminate a foot or two above a grating which should lead into the sewer. I may here remind the householder that the cistern for the water-closet should not be the same as that which supplies drinking water for the house, nor should the cistern for the closet be in direct communication with that from which the drinking water is taken, that is to say, the drinking water cistern should not be fed from the water-closet cistern. It should be the reverse—the water-closet cistern should be fed from the cistern containing the water used for culinary purposes, and the pipe leading from one cistern to the other should be trapped with a syphon bend, or by a separate pipe.

The number of cases of lung disease that might be prevented, or at any rate kept in abeyance, by a proper use of the known laws of ventilation, is incalculable; when this becomes better known we shall have more attention paid to it. It is so simple, but its benefits are not directly visible or tangible, there-

fore the bulk of people throw it on one side. In selecting your house, note the windows ; see if they are sufficient both in number and size, and are placed in such positions that, by opening them, you have a complete draught of air through each story. On no account tolerate a window that will not open. Fortunately, there are not many so made now. Some of the older cottages still have them, but I hope none of the new ones.

There should be a fireplace in each room, even if it is destined only to act as a ventilating shaft. The noxious plan of placing bags of shavings in the chimneys of the bedrooms when the grates are not used for fires, should be strenuously discouraged. The reason often given is that the smoke of one chimney comes down the other, where they both end in a common vent ; when that is the case, representations should be made to the owner, and a plan adopted by which it can be prevented. It would be better even to have a separate shaft than to sleep in a room where the air cannot be changed and so be breathing the same air over and over again. The size of the room and the amount of air it contains is an important item. The volume of air in a room is calculated as cubic space for scientific purposes, and we cannot do better than follow in the same lines. To obtain the cubic

space in a room, we have simply to multiply the length by the breadth and the product by the height. In order to be able to form an idea how much cubic space is required by an individual per hour, I may state that in the army the amount of authorized regulation space is six hundred cubic feet per man per hour, but the amount thought to be necessary for perfect health is three thousand cubic feet per hour. The amount you would fix on for yourself should lie between these. At the same time, do not fall into the error of supposing that increased cubic space will compensate for change of air, as it will not. We should approve of and recommend a house where the staircase is built in such a way as to have a central shaft or tubular opening from basement to roof. If this is capped by a skylight with ventilating openings, it is a perfect ventilating shaft for a house. The heated air from the rooms below pass up it and escape at the top, and fresh air rushes in to take its place; to make it more efficient, if the house is in a town, an artificial light, say a gas-burner, placed close to the skylight would light the stair and also assist in ventilation, thus well ventilating the house. Added to this, if you have air-shafts leading into the rooms from without; ventilators over the lights, be they gas or oil; and hot-air chambers behind the grates, so as to ven-

tilate the room with warm air in winter;—you have as much as you can expect in the way of ventilation in this class of house, and for all practical purposes as much as you require. It is quite true that there are many more appliances placed in rooms for ventilating purposes which might be mentioned, some of which, however, are of doubtful utility, and could not reasonably be expected to be found in such houses as these we are describing. The doors in a room should be so placed as also to assist in ventilation, which as a rule they generally do.

Much that has been said with regard to ventilation is applicable to light. We know that, like a plant, we may exist almost without it, but we become poor, weak, sickly, anæmic creatures. That light is almost as necessary for us as air, we need no scientific training to know. We may be perfectly ignorant of the various hypotheses that have been put forward to explain the origin of light; the emission, or corpuscular, theory or the undulatory theory may be to us an unknown language; still we can read a language of common, plain, daily observation in the pallid looks and the emaciated forms that issue from the dense, close, dark alley or court, where light and the pure air of heaven alike are strangers. Contrast this with the big, burly, bronzed figure that one sees in

the harvest-field—the true son of the soil, whose avocation calls him constantly into the open air, and whose weather-beaten skin shows the marks that nature's forces by their continual play have wrought upon it. The contrast will at once prove to the observer who is in pursuit of health how necessary for our existence and development are both air and light. One of the reasons why trees and shrubs generally are so objectionable when close to a house is that, besides preventing a free play of air, they obstruct the light, make the rooms in a house dark, and subject the inmates to the want of those chemical changes which, when applied to plants, renders them colourless, or in botanical terms, etiolated. As we have already said, windows in all houses should be large, so as to secure as much light as possible, and there should be more than one in a room if the architectural details will admit of it. Glass skylights are good, as they often give light to passages which, but for them, would be in continual darkness. As much light as possible should be admitted into the house, both into the living and sleeping rooms.

That heat is necessary for the human body experts. have decided for us. Even if they had not, our feelings and experiments on ourselves would soon prove it to us. If we go to the animal kingdom,

we find that stables properly warmed are better for horses than cold ones—they thrive better in them. If we go to the shepherd, he will tell us that sheep do better here, or cattle there, because it is warmer. So it is with the human body ; an equable temperature, only varying with the season, is necessary if we wish to keep ourselves in good health. Colds, catarrhs, chills, etc., are produced by sudden changes ; quickly transferring the body from a warm atmosphere to a cold one is at the bottom of half the climatic ailments we suffer from. Therefore it is of great importance that we should maintain an equable temperature in our houses. I do not advocate a high temperature. An ordinary healthy individual thrives best with an average temperature of 55° to 60° Fahr. Some people advocate an average temperature some degrees higher than that. The objection to that is that in the depth of winter, in order to maintain that temperature, ventilation has to suffer ; you are obliged to prevent the ingress of air in order to heat up the air contained in the room, as the constant influx of cold air would persistently keep the temperature down. What you gain in temperature you lose in purity. We need not go into the different ways in which heat is communicated by radiation, conduction, and convection. Let it be

sufficient for us that we maintain, by means of fires, etc., an equable temperature in our rooms with free ventilation. To do this you must see that there is a fireplace in each room, and, should the entrance hall be large enough, it would be as well to have one there. Steam and hot-water pipes, and the German system of stoves, are very useful for warming purposes; and many ingenious plans have been adopted for warming houses which need not be gone into here, as they are unsuitable for the class of houses we are here considering. The only one besides the open grate that might be used in this class of house is the hot-air chamber behind the grate, of which we have spoken in connection with ventilation. In the bulk of small houses, the grate is against the outer wall, with the chimney outside; therefore a very large proportion of the heat generated by the grate passes up the chimney and is lost. By having a chamber behind the grate opening into the room, either upstairs or down, this is utilized instead of being lost.

Before finally fixing on a house, the neighbourhood should be examined, to see if there are any manufactures or works that might poison or be detrimental to the air in its immediate neighbourhood. We know that certain trades, manufactures, and works throw

off gas and refuse material which are often not of the most wholesome character. Thus it is well known that the decomposition of dead bodies in a churchyard gives rise to unwholesome odours, unless very great caution is exercised; that the same is true of slaughter-houses and knackeries, which give off much foul effluvia. Alkali works give off hydrochloric acid, and chemical works generally much sulphurretted hydrogen; copper works, sulphurous and sulphuric acids; iron and copper furnaces give off a great deal of carbonic oxide; many tin and silver works give off nitrous acid; brickyards are notorious for giving off sulphurretted hydrogen and carbonic acid. These are only a few out of a large number that might be mentioned. The effluvia from many of these are very unpleasant; they often constitute a nuisance without being absolutely hurtful. You should not select a house in the immediate neighbourhood of one of these; you should rather avoid the possibility of having the blood contaminated by breathing in air with an excess of any of these constituents. All air contains many of these gases, but, generally speaking, in very minute quantities and widely diffused, and in that way apparently are harmless; whether they remain so when the air is tolerably strongly impregnated with them, is a still disputed

question, which will be decided, perhaps, when we have more evidence on the subject. Many trades are injurious to the workers from the fact of their being in workrooms where the dust of the materials they are at work upon is carried in the air and breathed, causing injury and disease to the air-passages of those employed. That would not, of course, affect the air in the neighbourhood.

We have already stated that too often convenience and price have too much to do with the selection of the house, and that sanitary requisites and the healthiness of the habitation too little. That convenience and price should be taken into account every one must agree. The tendency of the present age is to rush into expenditure too readily, and the thrift and care of the last century are scarcely anywhere now to be found. The national prosperity ten years ago has increased all our wants, and what used to be considered luxuries are so no longer, but have become necessaries. If, as a nation, our powers of production kept pace with our wants, it would not be so much a matter for regret, but unfortunately they do not do so. It is all the more necessary that we should, at some time in our investigations, take into consideration the question of convenience, that is to say, of selecting a house close to our work, or close to a station some-

where, so that we can readily get to and from our business. This is not a question that can be so readily solved. As sanitarians, all the advice we can give is to repeat that, if you are halting between two houses—one close to your business and not in a good sanitary state, and one situated inconveniently for your business but in a better sanitary condition, select the one in the best sanitary state, even if you have thereby to add to your working hours and shorten your time for rest; in the long run you will find you are the gainer. So with the question of price. It is no economy to have a house at a low rent if it be in an unwholesome condition. If you are wavering between two houses—one at a high rent but in a good sanitary state, and the other at a low rent and in an unsanitary condition, select the one at the higher rent; it is the cheaper of the two. As years roll on, you will find that you have gained, in unbroken health and absence of all expenses attendant on illness, a sum of money far in advance of the difference of rent in the two houses. Every one may not believe in these views, and possibly some may even be sceptical of the advantages of sanitation. If so, hear what Mr. Edwin Chadwick says about sanitary progress: "The following table shows the death-rate for each of the last four decennial periods:—

"ENGLAND AND WALES.

Annual death-rate per thousand.

	1841–50.	1851–60.	1861–70.	1871–80.
All causes	22·4	... 22·2	... 22·5	... 21·5
Seven zymotic diseases	—	... 4·11	... 4·14	... 3·36
Fever	—	... 0·91	... 0·88	... 0·49

"From the above figures it will be seen that, speaking generally, the death-rate of the country remained stationary from 1840 to 1870, but that in the period 1871–80 it fell from 22·5 (of the previous decade) to 21·5, a reduction equivalent to 4½ per cent. It may, therefore, be roughly estimated that about one-quarter of a million of persons were saved from death in the ten years 1871–80, who would have died if the death-rate had been the same as in the previous thirty years. If twelve cases of serious but not fatal illness be reckoned for every death, it follows that about three million persons, or over one-ninth of the whole population, have been saved from a sick-bed by some influences at work in the past decade which had not been in operation previously." And when, in addition to this, you come to consider that the population has steadily increased, the death-rate would have been a gain had it remained where it was, but to absolutely decrease in the face of an increasing population, is to make an advance worthy of the name.

The promise was to prove to the middle and lower classes of society that, though their homes may be humble, they may be none the less as wholesome and in as sound a sanitary state as the mansions of the rich. If a house will satisfactorily answer the queries we have suggested, it is a house in a fairly sound sanitary condition, and a person living in such a house has the chance of fair health. But the class of people for whom this is written would, I fear, as soon take a house in an unsavoury condition as one in the most perfect sanitary state. While that is the case, no stimulus is conveyed to the owners to put them in a healthy condition. As soon as the general public become critics in these matters, and avoid unsanitary houses, the demand for healthy abodes will produce the supply.

This little work is intended for the popular mind ; it contains no startling new revelations, no wonderful discoveries. The endeavour is to give scientific facts without going into the science of them, and I have tried to quote, where quotations have been necessary, from well-known authors of ability and standing. Many of the facts may be old, but they lose none of their value from being repeated. To the *savant* they may be trite, but to the bulk of the uninitiated public they will, to a certain extent, be new. If this only

helps to fix on the popular mind the basis of sanitary laws, and enables them to choose healthy houses and to reject unsanitary ones, this little work will have achieved the object for which it is written.

THE END.

PRINTED BY WILLIAM CLOWES AND SONS, LIMITED, LONDON AND BECCLES.